THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

Publishing Office, No. 42 Pine Street.

Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science.

VOLUME XVII.—No. 4.
WHOLE No. 303.

NEW YORK, FRIDAY, AUGUST 16, 1872.

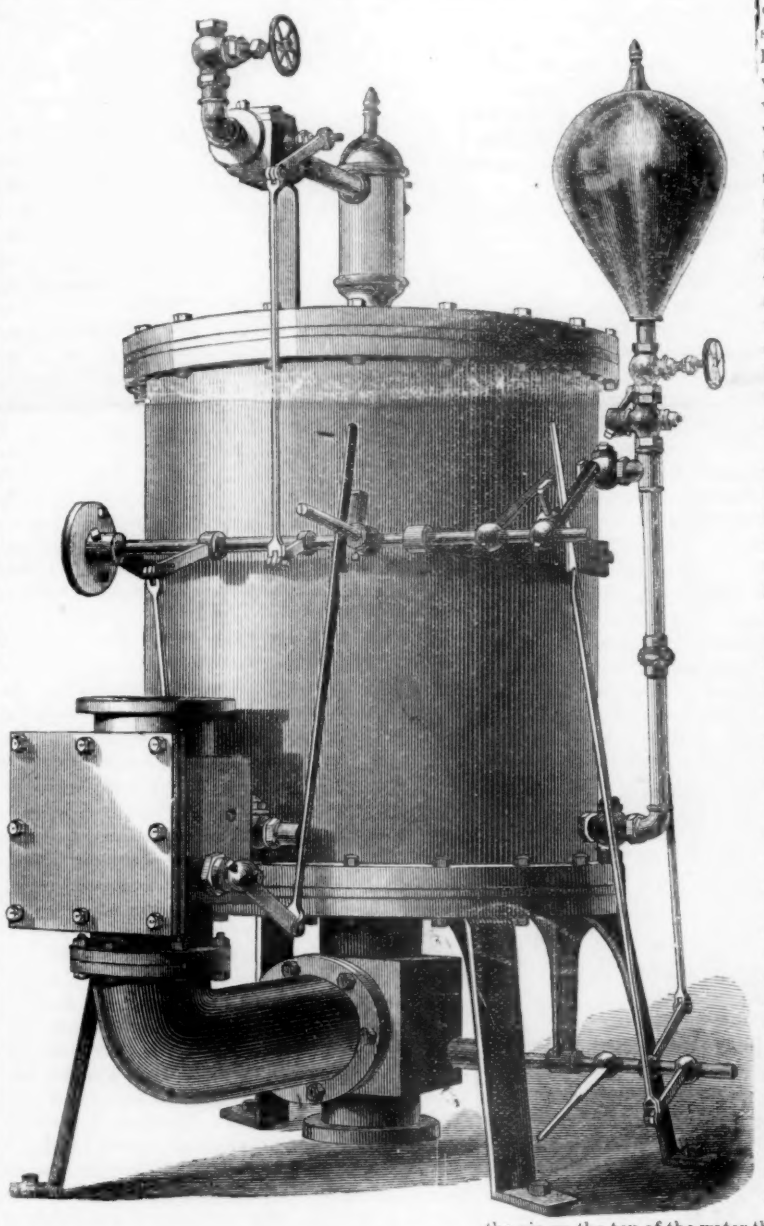
$3 PER ANNUM
IN ADVANCE.

Improved Automatic Vacuum-Pump.

The first investigator who described a way of raising water by the direct action of steam-pressure was Salomo de Caus, in Paris, France, about the year 1615. He made a steam boiler with a long tube passing inside down to within a few inches of its bottom; and when the steam was raised, the pressure drove the water out through the tube to a height proportional to the pressure. By this means, however, he only succeeded in raising the hot water of the boiler itself. Various improvements on the original invention have been effected in succeeding years by different inventors, all of which, however have been subject to serious defects, but they in a great measure have been overcome by the important improvements of Mr. James H. Pattee and George H. Nye, the inventors of the subject of our illustration. The labor of opening and closing the valves had already been overcome by other inventors, who attached them to floats; but these were found unreliable, and also not to open or close at the right instant. The chief objection, however, was the alternate extremes of temperature to which the receiver was subjected. When the cold water was being expelled, the steam taking its place was, during the expulsion, partially condensed by the cold sides of the vessel, losing thus a great portion of its pressure and heating the vessel, which is at once cooled off again by the re-entering water.

The engine herewith illustrated having the enormous advantage of extreme simplicity, it was worth while to labor to overcome the objections. All the expensive features of the complicated and heavy low-pressure pumping engines are wanting. There is no bored out steam-cylinder; no well fitting piston and valves; no air-pump with its piston and valves; no accurately turned pump-cylinder with its piston and valves; no working-beam, connecting rod, etc.; no piston-packing to get out of order; in fact, if the principle of the engine in question had not been explained by us here, and if we had commenced by asserting the existence of a pumping-engine in which all these parts were totally absent, many would have most assuredly doubted the truth of such a startling statement. It is evident that the first cost of such a machine, being so very simple, must be far less than that of an equivalent ordinary steam pump. It takes up much less room, and as the steam pressure acts immediately on the water to be raised, without the intervention of all those complicated details of machinery, merely the power saved in momentum of these ponderous moving masses, and of their friction, would be an important item of economy.

We will now explain the working of the engine. As the steam is turned on at the top of the cylinder, and fills the same, it is clear that by the condensation of this steam a vacuum will be formed. The cylinder is



connected below by means of an iron tube, with the well whence the water is to be raised, and which may be at a distance below the machine of not more than thirty feet, since, according to the well known law of atmospheric pressure, a vacuum cannot raise water much beyond this. This tube is provided with a check-valve in the square box) seen below the cylinder), which, as it opens upward, prevents the water raised from returning. The axis of this check valve (seen to project at the right hand side) serves two purposes; it is, of course, lifted by the ascending water, and when the suction ceases and the water stops in its ascent, it closes by its own weight, assisted by a sliding weight, which may be suspended to the empty lever attached to the axis. This sets two other levers in motion; the one projecting toward the leader turns on the steam at the top, by the intervention of a few other levers, and the other opens a cock connecting the inside of the conical air-vessel (seen at the upper right hand corner) with the lower part of the cylinder. The steam now being admitted over the surface of the water, which nearly fills the cylinder, will drive it out through the ascending pipe, to be attached to the top of the valve-box, seen at the left hand, and also a small portion into the conical air-vessel (at the upper right side), compressing the air on the top of the water thus introduced, which serves as an injector for the condensation of the steam. The valve-chest (at the lower left side) possesses also a check-valve opening upward, which closes as soon as the steam pressure has expelled the water from the cylinder, and the axle of this check-valve (seen projecting outward) is provided with a lever which by

means of a rod and catch (seen in the figure) turns off the steam, and at the same time opens the communication between the conical air-vessel and the cylinder, so that the compressed air suddenly injects all the cold water, with which it is partially filled, into the cylinder. This, of course, at once condenses the steam, the vacuum is again formed, the cylinder is filled by suction, or rather by atmospheric pressure from below. When the cylinder is nearly full again, the check-valve in the chest below closes, and the same operation is repeated.

This steam pump could be made to act by pressure alone, by suction alone, or by both, as described. In the first case, the cylinder may be placed so low that the water would flow in by itself; but then the advantages of the vacuum formed by the condensed steam would not be utilized. In the second case, the cylinder is placed at the full height to which the water can be raised by atmospheric pressure; then it would work to the greatest advantage and in the most economical way, as low steam, say of one pound pressure, will fill the cylinder, and by condensation produce the same vacuum, as high-pressure steam. At low temperatures we lose less heat, and have the same amount of steam in a larger bulk, filling the cylinder with a less expenditure of steam, and obtain the same result as with any other vacuum, namely, we raise the water by atmosphere pressure to about 30 feet, thus taking advantage of this agent to its fullest extent, and if the cylinder is placed so high that the water simply flows out, when the steam enters, it is possible to raise water actually 30 feet high, with steam of even less than one pound pressure, a feat which likely no other steam pump can perform so well.

The pump may be used for city water works, mines, railroads, steamships, breweries, sugar-refineries, tanneries, manufactories, or, in fact, in any situation where any other pump could be applied. It is manufactured by the Automatic Steam Vacuum Pump Manufacturing Company, 48 Courtland street, New York, where communications may be addressed.—*Manufacturer and Builder.*

Crystallization in Wrought Iron.

Mr. Roebling states that the most fibrous bar may be broken so as to show a granular and somewhat crystalline fracture, and this without undergoing any molecular change in the texture. "Take," he says, "a fibrous bar, say 10 feet long, nip it in the center all around with a cold chisel, then poise the bar upon the short edge of a large anvil and a short piece of iron placed eight or nine inches from the edge on the face of the anvil, and strike a few heavy blows upon the nip so that each blow will cause the bar to rebound and to vibrate intensely, and the result will be a granular and somewhat crystalline fracture. Now take up the two halves and nip them all around again, about one or two inches from the fractured ends, and break them off by easy blows over the *round* edge of the anvil, and the fiber will appear again. This experiment proves that a break caused by sudden jars and intense vibration may show a granular and even crystalline fracture, without having changed the molecular arrangement of the iron.—*Sci. Amer.*

The New System of Canadian Patents for Americans.

If the invention is already the subject of a patent in the United States, the application for the Canadian patent must be filed within one year after the date of the American patent. The invention must not have been in public use or on sale for more than one year previous to the application in Canada. The patent may be obtained by the inventor or his assignee, but not by a mere importer or introducer.

The government fees are twenty dollars in gold or Canadian currency for five years; forty dollars for ten years; sixty dollars for fifteen years. The fees for the extension of a patent from five to ten years are twenty dollars; ten to fifteen years, twenty dollars; from five to fifteen years, forty dollars.—*Amer. Artisan.*

Chemical Repertory.

No. 74.—August 16, 1872.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

Gas and Coal-Tar Chemistry.—A number of items immediately following are put in juxta-position, because relating to these two subjects. In this department it has been customary for us to *mix things* as much as we could conveniently, thinking thus to make it more interesting to the general reader. Hereafter, however, we may classify some subjects to some extent.—Ed.]

407. Tobacco Smoke.—Vohl and Eulenburg have investigated the narcotic action of tobacco, especially examining the action of tobacco smoke. As the result of their analysis, they are led to the opinion that the disagreeable symptoms of the incipient smoker and the chronic affections produced by smoking, as well as the poisonous effects of tobacco smoke juice when swallowed, are due to the bases pyridine and picoline, and not to nicotine. The explain the fact that stronger tobacco can be smoked in cigars than in a pipe, by finding that more of the volatile bases are present in pipe smoke, more especially of the very volatile and stupefying pyridine; while in a cigar little pyridine and much collidine are formed.

408. Formation of Acetylene.—Berthelot.—After first referring to the modes of formation of acetylene in general, the author states that he also obtained this body by applying Houzeau's apparatus for making ozone, passing the electric current through hydrogen saturated with vapors of hydrocarbons; but the quantity of acetylene thus formed is very small, and the author ascribes this to the fact that the electric discharge attended with sparks has a far higher temperature than the dark (non-luminous) discharge, and that, while acetylene is not decomposed by a high temperature, ozone cannot be formed under the latter condition.—*French Academy.*

409. Action of Chromic Acid on Gas Constituents.—E. Ludwig.—The author describes at length, and illustrates with a wood cut, his method of manipulating with the gases just named, for the purpose of testing the action of saturated solutions of chromic acid upon them. It appears that carbonic oxide is rather readily oxidised by chromic acid forming carbonic acid; hydrogen, although far more slowly, is also oxidised, water being the result; marsh gas is not at all acted upon, even when left in contact with chromic acid for a week; olefiant is not—at the ordinary temperature at least—very readily acted upon, and, in addition to water and carbonic acid, there is also formed formic acid, and probably acetic acid.—*Annalen der Chemie.*

[Of this investigation we have had some previous notices. As it seems to us very important in connection with gas analysis, we may seek time to prepare an abstract.—Ed.]

410. Ethyl-Naphthaline. Acenaphthene.—Berthelot and Bardy.—Ethyl-naphthalene is a complex hydrocarbon, discovered by Drs. Fittig and Remsen, by means of tha reaction of bromated naphthaline, hydriodic ether, and sodium. Ethyl-naphthaline $C_4 H_4 C_{20}H_{10}$, differs from acenaphthene in having two equivalents more of hydrogen, the formula of acenaphthene being $C_4 H_2 C_{20}H_8$. This last named body was first discovered by the authors, having been prepared by causing ethylene or acetylene to react at red heat upon naphthaline: acenaphthene occurs ready formed in coal tar. The methods of conversion of ethyl-naphthaline into acenapthene are described by the authors at length; one of these methods consists in passing ethyl-naphthaline through a red-hot tube, this decomposition being elucidated by the formula—

$$C_4 H_4 C_{20}H_8 = C_4 H_2 C_{20}H_8 + H_2.$$

Another method is by the wet way—treatment with bromine and alcoholic potassa solution, at a higher temperature; this reaction—which, however, yields only a very small quantity of acenaphthene—is elucidated by the following formula:

$$C_4 H_3 BrC_{20}H_8 + KHO_2 = C_4 H_2 C_{20}H_8 + KBr + H_2 O_2$$

Ethyl-benzine has been by the authors converted, by the last mentioned method, into styrolene.—*French Acad.*

411. Black Coloring Matter Contained in Native Bitumen.—Le Bel and Muntz.—The authors have extracted from bitumen (native as well as that obtained from tar) a black colored substance, insoluble in alcohol and ether, soluble in sulphide of carbon and chloroform, and fusing—without volatilising—at between 130° and 145°. This substance, which possesses very great coloring power, has been called asphaltene, and was found to consist chiefly of carbon and hydrogen. From an Egyptian bitumen the authors also obtained a similar body, but this was found to contain more oxygen, and, moreover, a notably large proportion of ash.—*French Chem. Society.*

412. On Chinoline and Leucoline, by C. Greville Williams. Ballo has recently stated in a paper "On Leucoline Oil and the Pure Naphthaline of Commerce" that he obtained a copious precipitate by treating sulphate of leucoline with potassium chromate, and that by the action of amylic iodide, he obtained a violet coloring matter apparently identical with chinoline blue; but the author had always found that, although chinoline forms a crystalline salt of great beauty with chromic acid, pure leucoline gives only a yellow oily precipitate, and, moreover, by the action of amylic iodide, leucoline yields only a faint, dirty purplish coloration, having no resemblance to chinoline blue. The diversity of these results, and also those of Hofmann, would be explained if coal-tar sometimes contained chinoline as well as leucoline. In order to settle this point, the author proposes to make comparative experiments with leucoline obtained from various sources. A letter was then read by the secretary from Mr. Dewar, of Edinburgh, in which he mentioned that by the oxidation of chinoline he had obtained two new crystalline acids, one of which is mono-carbo-chinolic acid. Its potassium salt, when treated with lime, yields pyrrol along with the lower bases, which induces the writer to believe that chinoline is related to pyrrol and indol.—*London Chemical Society.*

413. Disinfecting Powders.—In a recent work on the practice of disinfection with carbolic acid and its various compounds, Mr, A. E. Sansom gives the composition of several disinfecting preparations that have come into general use. Since 1858, crude carbolic acid, mingled with various sbbstances in the form of powder, has been used for disinfecting purposes. The first compound of this kind, the powder of MM. Carme and Demeaux, was brought out in 1858, and consisted of plaster of paris and coal tar. Following this was the powder of Bonchardet, containing one part of carbolic acid to one thousand of plaster of paris. Parisel's powder contained one part of carbolic acid to one hundred of coarse meal and four parts of lard, or some other form of fat. McDougal's powder is thirty-three per cent. sulphate of magnesia and the rest water. Calvert's powder contains from twenty to thirty per cent. of carbolic acid, mixed with pulverized refuse of alum works; the last two are believed to be the most efficient. According to Dr. Parkes, half and ounce of either Calvert's or McDougal's powder will preserve four ounces of sewage from eighteen to twenty-one days. The efficacy of the powders may also be due in part to another cause. Most of them are powerful absorbers of water, the removal of which from the decomposing matter reduces its tendency to putrefy.—*Arts.*

414. Arsenic in Colored Carpetings.—Hallwachs has found that not only green but also the red-colored carpetings frequently contain arsenic. He particularly asserts that the brilliant dark red colors now so

greatly in demand, contains enormous quantities of this poisonous substance. The goods burned with the blue flame of arsenic, and gave its characteristic garlic odor. Enough of the color could be rubbed off with the finger to give a distinct precipitate of arsenic with the usual reagent, and in solution in hydrochlolic acid covered some copper pieces with the greyish coating characteristic of the substance.

415. Poisoned Colors.—The coal-tar colors, now such important articles of commerce, are under certain circumstances capable of exerting injurious effects upon the human constitution, to which public attention ought to be drawn. Aniline itself is acknowledged poison, and all colors containing it in an unchanged state are poisonous also. The general symptoms of aniline poisoning are a changed color of the skin, deep violet color of the lips, an accelerated pulse, shivering of the whole body, trembling of the hands and feet, anxiety and difficulty of respiration. Many of the oxidizing agents used in the preparation of aniline colors are also poisonous, such as the arsenic acid, chlorides of zinc and tin, compounds of antimony and lead, etc. The true cause of poisoning in these cases is not, therefore, the color itself but the impurities present, and the acids, hydrochloric, arsenious and picric, with which it may be combined. The latter, in particular, is found in many of the modern colors, such as the aniline-greens and the orange preparations. The low qualities of colors, especially aniline-crimson prepared from residues and loaded with impurities, are most to be dreaded. Such colors, from their low price, are used in staining paper-hangings, wooden toys, flutes, matches, cheap confectionery, and bon-bons, such as are sold at fairs, india-rubber articles, etc. From many of these the color is easily removed. Woolen and mixed tissues dyed with the coal-tar products are now very largely used, owing to the brilliance and comparative cheapness of the color. Needle-women and others who have to work much with these materials often suffer from the effects of the arsenic and picric acids. The fingers are inflamed, showing small pimples upon a red ground; the face is also similarly affected. Equally injurious are the phenol colors prepared from phenol or carbolic acid, traces of which remain uneliminated. Rosolic acid, coralline (peoline), and azuline are rarely found in the market free from these impurities. Their use is thus liable to give rise to diseases whose origin and nature are not easily recognized.—*Mechanics Magazine.*

416. Thermometrical Experiments.—The Providence *Journal* describes the following interesting experiments made in that city with an excellent glass mounted thermometer (Fahr). In the house with open windows, it stood at 90 2°. Out of doors in the shade, at 95°; freely suspended in the sun, six feet above the greensward, 99 5°. In the same position, with wet bulb, 79 9°; with bulb covered with black silk, 169·96°. When laid upon the grass in the sun, it rose to 104°. Laid upon white cloth, placed upon the grass, 105·0°, and when similarly placed upon black silk, it indicated 113°. The expsriments with different colored coverings show very conclusively the utility of light colored clothing for those who are obliged to be exposed to the direct range of the sun at high temperatures; and the experiment with the wet bulb shows as clearly the value of free perspiration in keeping down the temperature of the body, which, however, the observer, in his own person, notwithstanding the perspiration while making these experiments, found to have risen to 100·5°, about 2 deg, above the usual standard for cooler days. The average temperature of the healthy human body throughout the year, in temperate climates, is 98 4; while in tropical regions it is about 1° higher.

417. Air Chambers in Water Pipes.—The following appears an excellent practical suggestion, from Dr. Vanderweyde: "The necessity of this precaution depends on the circumstances. For the sake of safety, we are in favor of having such an air-chamber always in every house, by preference attached at the end of a long stretch of pipe, either on top floor, or at the greatest distance from the connection with the main pipe. In all ordinary faucets the click can in many circumstances be heard, and even felt in the pipes, at the closing of the cock, and this continual jarring injures at last the pipes; it stretches them diagonally, so that when there is a weak spot. it will at last begin to leak. A very narrow piece of tubing, about two feet long, placed vertical, closed at the top, and connected at its lower end with some part of the water pipes on the top floor, is sufficient to stop the jarring. We had this principle applied lately in our private residence, and cured with this simple remedy a most intense jarring of the pipes in the whole house, which took invariably place when one of the sixteen stopcocks was closed. There was, however, one which closed very gradually by means of a screw motion. Such a cock, of course, does not require the precaution of attached air caambers."

418. How to Preserve a Carriage.—A carriage should be kept in an airy, dry coach-house, with a moderate amount of light, otherwise the colors will be destroyed. There should be no communication between the stables and coach-house. The manure-heap or pit should also be kept as far away as possible. Ammonia cracks varnish and fades the colors both of painting and lining. A carriage should never, under any circumstances, be put away dirty. In washing a carriage keep out of the sun, and have the lever end of the "setts" covered with leather. Use plenty of water, which apply (where practicable) with a hose or syringe, taking great care that the water is not driven into the body to the injury of the lining. When forced water is not attainable, use for the body a large, soft sponge. This, when saturated, squeeze over the panels, and by the flow down of the water the dirt will soften and harmlessly run off, then finish with a soft chamois leather and old silk handkerchief. The same remarks apply to the underworks and wheels, except that when the mud is well soaked, a soft mop, free from any hard substance in the head, may be used. Never use a "spoke-brush," which, in conjunction with the grit from the road, acts like sand-paper on the varnish, scratching it, and, of course, effectually removing all gloss. Never allow water to dry itself on the carriage, as it invariably leaves stains.—*Sci. Amer. quoted from an English Source.*

"Phunny."

Mr. Boyle recently "norated" to the American Institute, the following: "At a newly erected lighthouse along the New Island Sound, an old sailor was appointed as keeper. On one of the first evenings, when trimming his lamp, he neglected his instructions to draw the curtains down, and the setting sun, shining through one of the large lenses, had, of course, its rays concentrated in the focus, and as here the lamp is placed, the heat was sufficient to light it, to his utter amazement. He put it out, but had become so nervous for the whole night, that his own image frightened him, as he saw it reflected in the plate glass of the lantern, with the dark sky outside and the strong light inside. The next morning at day break he put out the light, when at sunrise the sun lit it up again, for the same reason as the evening before. This was too much for the old salt. He immediately packed his trunk and left, without notice to any one, and was only missed when at night the lighthouse remained dark. When found in the neighboring village, he declared that the lighthouse was bewitched, that Satan had lighted his lamp twice, and that he had seen him *in propria persona* during the whole night outside the tower, looking in at him. It was, of course, his own image that he had seen. His supposition was, to be sure, not complimentary to himself in regard to his own appearance; but he was not to be induced to return at any price, and another keeper had to be provided."

British Association of Gas Managers, June, 1872.

Report of Mr. Mellor, on the "Eveleigh Process"; with Discussion.

Mr. Mellor introduced his paper by remarking:—About a month ago your worthy president asked me whether I could read a paper on this subject before the association. I had no idea at that time of doing so, at least, in the present state of things; but yielding to his request, I have endeavored to put a few items of information respecting the patent gas process together, which I have much pleasure in laying before you. They relate more particularly to the mechanical portion of the question. The whole process, as you are, perhaps, well aware from the statements made in the *Journal of Gas Lighting*, is now under the investigation of two eminent men, and pending their inquiries I have felt it my duty not to enter much into the question of the chemical portion of the invention. Had I done so, it would, as it were, be taking the ground from under their feet; and I am fully aware that they can deal with the matter far more satisfactorily than I could do. With these few words, I will proceed to read what I have to say.

The object I have in reading this paper is to describe the particulars and details of the system of making gas as patented by Dr. Eveleigh, and to give to my fellow gas engineers the results of my own experience, arrived at after carefully examining the method on a small scale at the works at Peckham, and also the practical working on a large scale at the works of the East Barnet Gas and Water Company, where, during the last five months, the gas supplied to the town has been made on this principle.

I would wish it to be clearly understood that although I have endeavored, as an engineer, to assist Dr. Eveleigh to arrange the form and details of the apparatus now used in the manufacture of the gas by his method, so as to render it as nearly as possible self-acting, I have nothing whatever to claim in regard to the principles of the invention, the merits of which, whatever they may be, are due entirely to that gentleman, who has devoted many years of his life to the consideration of this subject.

The system patented by Dr. Eveleigh may be briefly be stated to be "the manufacture in the first place of gas from coal under a comparatively low temperature in the retorts of the ordinary shape; and, afterwards, converting into gas the greater portion of the rich oils or tar produced by the first part of that process." These two operations are carried on simultaneously, and the two gases are mingled together as soon as they are generated, and pass on to the condensers and purifiers in the ordinary manner in a gas work.

The first patent taken out by Dr. Eveleigh was dated the 7th of January, 1869, No. 45, and had for its object the conversion of the coal and the whole of the oils and vapors into permanent gas in one continuous process in a manner somewhat different from that patented by Mr. Basford, and, at the same time, to purify the gas by passing it through heated chambers filled with a permeable material consisting of a mixture of charcoal, chalk, lime, iron filings, etc. This method, although successful to an extent somewhat greater than what may be called experimental, was found to have some difficulties in manipulation, chiefly in regard to the deposits of carbon in pipes, and the before-mentioned permeable materials, and it became necessary to consider how these difficulties could be overcome, and, at the same time, secure the rich gases which the oil contains.

After numberless experiments, and changes in the form of the apparatus, Dr. Eveleigh found that the best results were obtained by the plan now adopted—namely, that of vaporizing the oil and oily matters *from the surface*, and thus turning all the richer and more volatile portions of the oil into gas, leaving the heavier unvaporizable bodies to fall to the bottom of the vaporizing pan, where they are allowed to accumulate to a certain extent, and whence they are

drawn off in the shape of pitch, which, when cooled, becomes hard like the specimen here shown. This system was included in the second patent, taken out on the 21st of February, 1871, No. 443.

The drawings show the whole of the apparatus, beginning with the general arrangement of the retort and hydraulic main adopted for the first distillation of the coal.

The retorts are by preference in section an oval or D shape, with the lower corners well rounded to facilitate the circulation of the heat in the oven. These may be arranged in benches of any convenient number; those at Barnet are set in beds of five to one fire. The coal is placed about eight inches thick in the retort, which of this size—24 by 16 inches and nine feet long—will contain a charge of from 4 to 5 cwt. This retort is heated to a dull red heat in daylight, or about from 1200 to 1300° Fahr., which experience has shown me is the most suitable temperature at which the coal should be distilled for all purposes. The gas passes off by the eduction-pipe placed at the upper part of the end of the retort (for reasons which I will hereafter explain), and then down through the dip-pipe to a vessel which I will call, with your permission, an hydraulic main condenser. The gas then passes through the leading-off pipe, to the ordinary cooling apparatus, scrubbers, and purifiers, on its way to the gasholder in the usual manner.

The eduction-pipe is placed at the back of the retort in order that the hot gas, containing, as it does, its oils in suspension, may be carried off as quickly as possible before any condensation can take place in the retort, and where, if the gas remained too long in contact with the heated surface, it would be decomposed and would deposit its carbon, and thereby lose a portion of its illuminating power.

The oils which are condensed in the cistern below the dip-pipe are of rather a light specific gravity, very little heavier than water, and in quantity (including that deposited in the leading-off pipe and condensers) about 30 to 40 gallons per ton of coal, and varying more or less with the quantity of the coal. A very small quantity of ammoniacal liquor (from three to six gallons per ton) is also deposited. These proportions vary as a matter of course with the intensity of the heat at which the coal is distilled. The oils are received together in the ammoniacal liquor in the tar-well, from which the oil is passed into a cistern placed high enough to allow it to run down to the oil distillation apparatus.

This apparatus, which we term the redistillation retorts, consists of three vessels—

1. The vaporizing pan.
2. The intermediate chamber, with a diaphragm across; and
3. The charcoal cylinder.

These are set from the furnace in the reverse order in which they are numbered, for the oil enters the vaporizing pan (1), the vapors then pass up the ascension-pipe through the intermediate chamber (2), and lastly through the charcoal cylinder (3), where it is converted into permanent gas; whereas the heat is first applied to the charcoal cylinder (3), where it is required to be the greatest (the best temperature, as far as my experience goes, is about 1600° Fahr., or a bright red), then it circulates round the intermediate chamber (2) at about 1100 deg. Fahr., and passing through the nostrils under the arch, over the top of the vaporizing pan (1), where it is sufficient to convert the oils into vaporous gas at a temperature of about 800° or 900° Fahr.

These oils, as you observe, run down from the cistern into which they are pumped from the tar-well to the cock placed above the funnel of the inverted syphon, which acts as a seal to prevent the vapors escaping. The oil is admitted at the rate of about six gallons per hour, and it runs down through the pipe into the vaporizing pan, which is filled with oil above the height of the lower test-cock. The fresh oil flows over the surface of the heated oils in the vaporizing pan and does not immediately descend to the bottom or mix with the heated oil to any great extent, and thereby that which has been an insuperable difficulty in making gas from oils—any violent agitation and gurgitation—has been prevented. The lighter portion only of the oils is vaporized, and the heavier bodies gradually assuming a greater density as the vapor passes off, fall to the lower part of the pan. These are discharged about every twelve hours, and when cooled become pitch of various degrees of hardness, according to the length of time they are exposed to the heat of the chamber.

The vapor rises up the ascension-pipe, and passes through the intermediate chamber, where it is gradually heated to about 1100°, or a very dull red. The object of the diaphragm is to prevent the passage of unvaporised oil into the charcoal cylinder by the sudden passage of the gas and vapors through the intermediate chamber, and also in the case of any possible gurgitation of the oil in the vaporizing pan, to intercept the frothy, oily matter which runs back again through the dip-pipe into the pan. The gas and vapors then pass downwards, permeating through the incandescent charcoal in the charcoal cylinder, the vapory matters being decomposed, and the oils thus converted into permanent gas. The gas then passes at the back of the apparatus from the exit-pipe at the bottom of the cylinder to the condenser, where any oily vapor which has not been thoroughly decomposed in its passage through the charcoal cylinder is recondensed, and returns to the tar well, where it mixes with the fresh oil from the first distillation of the coal. The gas at this point is mingled with that of the first distillation, and the two gases pass on together to the condensers.

The most important feature in the manufacture of gas by this process is the heat at which the coal is distilled in the retort, for on this, in a great measure, depends the quantity and quality of the gas obtained, and what is most important, the quality of the oily matters; for if too great a heat be applied, the gas will have less illuminating power, a greater amount of sulphur in the shape of—to use the "referees" phrase—"sulphur compounds other than sulphuretted hydrogen" will be formed, and the oil will be rendered almost useless for further treatment for conversion into gas, and if too low a temperature be used, there will be but a small quantity of permanent gas generated, and a greater quantity of oil, whilst the residue, in the shape of coke, would be of very little use.

In the distillation of coal at a high temperature the sulphur combines freely with the carbon, giving rise to the formation of bisulphide of carbon, but a portion also of the sulphur unites with the earthy compounds and carbon in the coke, while another portion passes off as sulphuretted hydrogen; whilst in the distillation of coal at a low temperature almost the whole of the sulphur passes over as sulphuretted hydrogen, a portion of which unites with the ammonia, forming hydrosulphuret of ammonia, which is readily absorbed by water and gradually becomes sulphate of ammonia, free hydrogen passing on with the gas; hence, in the latter process, the coke is freer from sulphur, and little or no bisulphide is formed.

So far as my experience goes, I have found that a dull red heat, or temperature of what I should consider about 1200° to 1400° Fahr., is the best for all purposes. The charge of coal for a retort nine feet long, 24 by 16 inches in section will be about 4 to 4½ cwt., and this, at the temperature employed, requires 12 hours to obtain all the gas from the coal. From several trials of Norfolk Silkstone coal made by me at the works at Peckham, I have selected, as a fair average, the following, as showing the rate of production of gas at each hour during the charge, which weighed 4 cwt.:

1st hour.....	190 feet.	7th hour.....	150 feet.
2nd "	240 "	8th "	140 "
3rd "	170 "	9th "	130 "
4th "	150 "	10th "	120 "
5th "	150 "	11th "	110 "
6th "	150 "	12th "	60 "
		Total.....	1760 "

The total produce was thus 1760 feet, or at the rate of 8800 per ton of coal, the illuminating power being 25 candles. The quantity of oil, as near as I could ascertain, was about 6 to 6½ gallons, or at the rate of about 30 gallons per ton of coal, with very little ammoniacal liquor. The amount of sulphur in the gas, according to Dr. Letheby's test, was 3·24 grains in 100 feet. This was, of course, a laboratory experiment, but it was made with a full sized retort, and with a full charge of coal in the same manner as would be used in large works, and therefore the inference is that with a reasonable allowance for working on a large scale there ought to be a similar quantity of gas produced from every ton of coal. We have hitherto, at East Barnet, used only the Norfolk Silkstone coal, but in our experiments at Peckham we have tried many other kinds of coal, and obtained similar results, varying in quantity and quality with the relative richness of the coal.

The redistillation apparatus is arranged of such a size as to distil the whole of the oil produced from a bench of ten retorts, and it is advisable that the oils should be used at once in the same proportion as they are obtained from the coal (for these oils are very volatile, and lose a considerable portion of their gas-producing properties if they are kept for any considerable time), and that the two gases be mixed in proper proportions, so that the quality may be regularly maintained.

The quantity of gas obtained from the distillation of the oil is about from 100 to 156 cubic feet from a gallon of oil. I have, as yet, had no reliable means of testing the illuminating power of this gas separately, and as it is not intended by the inventor that it should be used separately, but that the two gases should be mixed as soon as they are generated, and used together, we must take the results of the two combined processes in endeavoring to ascertain its value.

The quantity of gas which, in my opinion, may be relied upon as obtainable from the Norfolk Silkstone coal by the combined process, will be from 10,000 to 11,000 cubic feet to the ton, and as the oil gas is not so rich as that from the coal, the illuminating power is considerably reduced by the mixing, the average being a little over 20 sperm candles from that coal.

The duration of the charge in first distillation of the coal being twelve hours, the quality of the coke is much improved, it becomes much harder, and consequently there is less breeze. The quantity produced is also greater, averaging in the Silkstone coal used at Barnet about 14 to 14½ cwt. per ton of coal. The consumption of fuel, in consequence of the low heats at which the retorts are worked, is less than it would be with the present system of high temperatures, but as there is also the second distillation to provide for, the fuel account may be taken to be about the same on the whole as by the present system in ordinary works of the same magnitude.

Up to the present time we have used iron retorts only, for at the requisite temperature there is little or no deposit of carbon in the retorts, and I do not think it will be possible to keep clay retorts gas tight at so low a heat. This, however, has yet to be tried, and if it can be done successfully, it will materially affect the cost of wear and tear. I have had considerable experience in the use of iron retorts under the old method, and from that experience, considering the low heats adopted by the Eveleigh process, I should unhesitatingly say that the wear and tear account might safely be taken at the same rate per 1000 feet as with clay retorts under the high heat method. There has not yet been sufficient time in which to do any more than form an estimate of this matter.

Any number of retorts may be set in one bench or oven, and I think it will be found advisable to have the redistillation apparatus arranged in proportion of one to every ten or twelve retorts. This would open an inquiry as to the space required, and I admit that it is a very important question, especially to those who have their works in the middle of large towns; but it must be borne in mind that as larger charges are used, and as the heats required are low, a greater number of retorts may be set in one bench. In my opinion, it will be quite safe to calculate that not more than one-fourth more space will be required for this process to make the same quantity of gas than for the ordinary method of gas manufacture. The labor cannot be more than that required in ordinary gas works, for one man can easily attend to six sets of the oil apparatus, all that is necessary being to attend to the furnace and see that the oil is kept flowing regularly, and once in every twelve hours, or thereabouts, to discharge the pitch from the vaporizing pan.

Having now described the apparatus and the manner of working the process, and having in the course of the paper given you my opinions on the production of gas and of the residual products and other matters, I now come to the questions which most of you will agree with me are the most interesting to every one concerned—Will it pay? What is its value commercially? Is there any practical difficulty in adopting it in daily use on a large scale? On these three questions the merit or failure of the system depends. Now, I take it to be the duty of every one connected with gas interests to inquire into these matters, and when any new invention or process is brought to their notice, having for its object an improvement either of the quality or purity of the gas, and also professedly giving an increased quantity from the same amount of coal, to see whether there is any truth in the statements set forth by those introducing them; and to this object I have very naturally turned my attention as regards this process.

Dr. Eveleigh states that by his processs the following advantages are obtained:

1. That the quality and illuminating power of the gas are much greater from the same quality of coal.
2. That the sulphur impurities are very much smaller than by the high heat system.
3. That the cost of the gas per one thousand feet is less.

These, if they can be justified, are very important results, and it now becomes my duty to give you in a few words the result of my own experience during the twelve months I have had my attention constantly on the subject. It would be useless and perfectly unprofitable to put down the figures as to the exact cost of the gas per one thousand cubic feet at the station meter, for in every town and in every gas works, large or small, the individual items bearing upon the cost of gas are different in every case, both as regards the value of coal and coke and the other residuals, the cost of labor and materials, and other local circumstances. I can only give you the data I have arrived at, and it will be for each of you who desire it to form your own estimate according to the local circumstances of each case.

The coal I have used at East Barnet is that from the Norfolk Silkstone pits, belonging to Messrs. Newton, Chambers, & Co., and on that quality my data are placed. Many other coals have been experimentally tried, but on full sized retorts at Peckham, and the results have almost invariably been in the same relative proportion as regards quantity and quality as the

same coals yield under the ordinary process. From this coal we obtain, including the oil distillation, from 10,500 to 11,000 cubic feet per ton.

The average illuminating power for the last two months is over twenty candles. The quantity of sulphur is under seven grains in one hundred cubic feet.

These are results obtained practically at the East Barnet works during the last five months, and the testings for quality have been made strictly under the "referees" rules at a distance of 1100 yards away from the gas works, and on the ordinary main pipes of the town. In addition to the the above three points, the following are the conclusions arrived at in my own mind as to the merits of the system, whatever kind of coal may be used:

1. That the quantity of gas made is greater, and the quality much better, than by the ordinary method.
2. That the labor is not more.
3. That the fuel will cost the same, or thereabouts.
4. That the wear and tear account will not be higher than by the ordinary method.
5. There is no difficulty whatever in the manipulation, nor choking of the eduction-pipes or apparatus.
6. That the gas, when made, is quite permanent, and produces no deposit in the mains beyond that of gas made in the ordinary manner.
7. The coke is greater in quantity and better in quality.
8. The space required to make the same quantity of gas in the same time will not exceed that required by the ordinary method by more than one-fourth.

And lastly, that the additional cost of the apparatus, including the oil stills, will amount to about £25 per retort in the first instance.

These are what I feel fully convinced are reliable data, on which the three questions asked may be answered; and, acting as the consulting engineer of the company who owns the patents, I cannot do more than give my opinion in the way I have. For myself, I have no doubt whatever that all the questions may be answered satisfactorily, and I strongly recommend the system to your careful attention.

The works at East Barnet are open to any member of the association who desires to see them, and every information will be given by the superintendent to visitors.

I fear that I have made my paper, though very imperfect, yet much too long, and that some of the details given are dry and uninteresting, and, perhaps, many of you will doubt the accuracy of the opinions I have given. I may be wrong for I am not infallible. I can only say they are the honest convictions of my mind, and as such I give them to you *quantum valeat*.

To those engineers and managers who are bound by their respective acts of Parliament to a high standard of illuminating power, it seems to me to be invaluable; for by this process the use of cannel coal, up to 20 candle illuminating power, may in many cases be dispensed with.

I have said very little of the chemistry of this matter; that is now under the examination of two very eminent men, well known in the gas world, and their report will soon be made on the whole subject.

The President invited observations upon the paper just read, and said he was sure Mr. Mellor would have pleasure in replying to any inquiries made, and in furnishing any further information on the subject in his power. He hoped the members of the association, as practical men, would not allow the opportunity to pass without a thorough ventilation of the question, which all would agree was a most important one. The tendency in the present day was to require from gas companies an increase in the illuminating power of the gas supplied by them. To meet this demand, the companies were put to very great expense in the purchase of cannel coal; and if, by any invention, the cost of production could be reduced, there was no doubt it would prove an immense boon. It was the duty of gas managers carefully to consider the question without prejudice, and when an opportunity like the present offered for obtaining information respecting a system whereby it was alleged that gas of a high illuminating power could be manufactured from common coal without the use of cannel, to avail themselves of it to the utmost.

Mr. Clift (Redditch) said, in opening the conversation, he felt bound to express his own feeling, which, he thought, was also the feeling of every gentleman present—viz., that the association was under great obligation to Mr. Mellor for the very able paper he had just read, and also for the very fair and candid manner in which he had laid the whole matter of Dr. Eveleigh's process before the members. He confessed that he came to the meeting a disbeliever in the system—a disbeliever from having himself, some years ago, tried the process of making gas at a low temperature with very unsatisfactory results. It was a necessity at the time, because he was then working iron retorts, in which high temperatures could not be employed without very heavy wear and tear. He had also used a process similar, in some respects, to Dr Eveleigh's for manufacturing tar into gas, and the results there, also, were by no means so satisfactory as those detailed by Mr. Mellor. In speaking of the invention now submitted for consideration, they must regard it, not exactly as Mr. Mellor had described it—viz., as one process—it consisted, in reality, of two distinct processes. There was the first manufacture of coal into gas in iron retorts at a low temperature, and, secondly, a subsequent manufacture of the resulting tar into gas. Now, all gas makers, especially old gas makers, knew what it was to use iron retorts worked at a low temperature, and that they could not get 9000 or 10,000 cubic feet of gas per ton of coal in them, as they could with clay retorts. The first process of Dr. Eveleigh's was a going back to the most antique method of making gas—the method by which Clegg made it in the first instance, and which certainly could not, as a rule, be adopted for economy's sake. By the process under consideration a larger quantity of tar was produced than by working at a high temperature, because this product was not decomposed and converted into gas. It was then proposed to take that tar and subject it to another and entirely distinct manufacturing operation, just as much so as if they bought tar in the first instance, and employed it in the production of gas. There was a distinct apparatus for the purpose, and so many cubic feet of gas were obtained from a given weight of tar. His own experience was that from ten pounds of tar he could make 100 feet of gas. But ten pounds of what tar? The very richest product from tar—the naphtha, the aniline. What was that worth per gallon? It was worth 1s. 3d., and from a gallon of that product it was proposed to manufacture gas to the value of 3d. The rich oil of naphtha, from which aniline was obtained, was worth 1s. 3d. per gallon in the market, and, with the whole of the apparatus which had been described, it was proposed to make this into threepenny worth of gas. He would ask any one whether this was likely to prove a paying process. Mr. Mellor said he would not go into the details of the profit and loss very minutely, but if he had done so, and had told the meeting what was the value of that rich portion of the tar which he converted into gas, there would have been no difficulty in arriving at the conclusion to which he (Mr. Clift) had arrived. Then Mr. Mellor stated that the cost of fuel in the Eve-process was much about the same as in the present mode of manufacture. Now, was it reasonable to suppose that with these two distinct processes for the production of 11,000 feet of gas, and with two fires constantly going, the cost of fuel would be no greater than in the production of 9,500 feet or 10,000 feet of gas with one fire? He thought the thing was palpably erroneous, and that it must be evident the cost of fuel would be greater. As to the cost of labor he could not say much; probably not much additional labor would be required, assuming the correctness of Mr. Mellor's statement that no stoppages occurred in the pipes, and that the whole process went on without much attention. Of course, the redistillation process was to a certain extent self-acting. There was a cistern of tar above, the contents of which ran down at a certain speed into the evaporator. The rich hydrocarbons were evaporated in that chamber, and passed into the retorts, and he supposed the coke was seldom changed, and therefore the labor would not be great. Still there was an additional labor. With iron retorts making 7,500 or 8,000 feet of gas per ton of coal instead of 9,500 or 10,000 seet, the labor must be greater in proportion to the quantity of gas made, because the charging and discharging were the same, the attention to the fires was the same, although from 20 to 25 per cent. less gas was obtained. To produce the additional quantity of gas, additional labor was required in the second process. What that was he could not say, and Mr. Mellor had very wisely left it to be ascertained by experience. He (Mr. Clift) did not propose to say anything fnather than that he admired Dr. Eveleigh, or any other man who, when he thought or believed, as no doubt he most thoroughly did believe, that he had discovered something of public advantage, was determined to follow it out and thoroughly investigate all its parts. If there was, after all, nothing in his invention, it would, like a thousand other things they had known, drop out of sight in the course of time; if, on the other hand, it possessed any practical value, these investigations would establish the fact, and the public would soon appreciate it.

Mr. Allen (Wellington) said he remembered about 13 years ago a patent was taken by Mr. Basford for making oil or tar and water into gas, and he was so unfortunate as to allow the process to be tried at his works. It seemed to him to be a process in many respects similar to the one now under discussion. His experience, however, was that unless the thing was continually watched, there was a danger of accident with it, and in his case one night the whole place was blown up, the man in charge had his leg and the small bone of his leg broken, and the company had to pay his wages all the time he was necessarily lying idle.

Mr. H. P. Stephenson said he sympathised very much with the poor man whose arm was broken by Basford's patent, but he was happy to state that no such accident had happened at the Barnet works with Dr. Eveleigh's patent. He rose to point out to the meeting that there was a very material difference between this and Basford's patent. Mr. Basford conducted his process in an ordinary retort, and passed the gas so manufactured through a charcoal chamber. But here there was an entire redistillation of the oil produced in the first process. He felt a great deal of interest in this question, and his friend, Mr. Mellor, had kindly allowed him to see the works at Barnet. He quite admitted that the thing was in its infancy at the present moment, but he believed it would ultimately prove a most valuable discovery, and it struck him as a matter most worthy of consideration, particularly at this time, when the price of coal and cannel was increasing to so fearful an extent. By it—upon the word of Mr. Mellor, which they had no reason at all to doubt—they would be enabled to get from 10,000 to 11,000 cubic feet of 20-candle gas per ton of common coal. Mr. Clift, who spoke against the patent, said he never got that: Mr. Mellor said he had; therefore they had the testimony of the man who had eaten the pudding against that of the man who had not had any. And not only was the fact of production vouched for, but there was the additional fact that the gas of this high illuminating power had been carried to and tested at the burners at a proper distance from the works. There was one consideration which had occurred to his mind in the first instance as a most serious objection to the use of this process. Take the case of his own company at Sydenham. They had a rental of £50,000 a year. What would be the effect on that rental of supplying to the consumers gas of 20-candle illuminating power instead of 15 as at present? Of course, the result would be to depreciate *per se* the rental to the extent of a third or a fourth. Now this was an objection which would rise in the mind of a great number of persons who were not tied to a high standard of illuminating power as at Liverpool, Manchester, and in Scotland. Supposing the rental of his company reduced in the way he had mentioned, it would have a most serious effect upon their profits. But the way in which he looked at it was this—that even assuming the public were not induced by the higher illuminating power and greater purity of the gas supplied, at the same price as before, to use a larger quantity, he thought it would be found of advantage to the company to adopt this process in combination with the ordinary methods of manufacture, so as to obviate the necessity for employing cannel coal. By so doing, they would be able to supply to the public gas of, say, 16 or 18 candle power, so that, as in the case of his company, instead of lowering the price of gas which happily in past years they had been enabled to do, but which they might be able to do in the future, they would be in a position to meet the demands of the consumers by raising the illuminating power. In this way, at all events, he thought the patent might prove useful to those gas companies which were not bound to a very high standard. In other cases, such as with the Brazilian companies, where a high illuminating power was demanded, the patent process would be valuable, because it would save the necessity for shipping cannel coal and thus enable them to make their gas much cheaper.

Mr. Fraser (Inverkeithing) said Mr. Mellor had vouched his word as an engineer to two very important facts—first, that with the same quantity of coal he could by the new process obtain a greater quantity of gas; and, second, that the gas so obtained was of a much higher illuminating power. He (Mr. Fraser) had seen the gas made at Barnet, and had no doubt at all that the illuminating power was much increased—probably it was double that of the gas in ordinary use. Under such circumstances the question was well worthy of consideration and careful investigation by all gas managers, seeing how largely the price of coal was increasing. But there was one point which appeared to him ought to be explained, and therefore he would ask Mr. Mellor a question upon it. Would gas made in the way patented by Dr. Eveleigh be permanent, or would it be condensed into oil?

Mr. Anderson (London) thought the only point omitted by Mr. Mellor in his paper was how much pitch per ton he had obtained.

[To be continued.]

Gas in Great Britnin.

By JABEZ CHURCH, C. E.

[Condensed from his Address as President of the Society of Engineers, at Westminster, February, 1872.

At the present period the consumption of gas throughout the United Kingdom is regarded as a subject of considerable importance, not only on account of the large capital employed in gas manufacture, but also because it represents a correspondingly import-

ant consumption of that nationally valuable material —coal. The consumption of gas is rapidly increasing, and its usefulness is daily extending, not only for lighting, but for heating and culinary purposes; it is in many cases being used also as a motive power in competition with steam. During the past year the colossal works of the Chartered Gas Company have been completed, and are now in full operation.

Through the kindness of the company's engineer, Mr. F. J. Evans, the members of this society had an opportunity of minutely inspecting the works, and were much gratified and instructed by the engineering skill displayed in the construction of the apparatus and machinery of this enormous manufactory.

The site purchased for the Beckton works is about 213 acres. The retort houses, four in number, are fitted with 1,080 through retorts, equal to 2,160 mouthpieces. The gas-holders, four in number, are equal to the storage of about 4,000,000 of cubic feet The works, with the number of retorts named, are capable of producing 10,000,000 of cubic feet per day, and for this purpose it will be necessary to consume the enormous quantity of 1,000 tons of coal during the same period. The provision made for the distribution of this large quantity of gas is of corresponding magnitude, and consists of an arterial main 11 miles long, more than three-fourths of which is four feet in diameter. the remainder being three feet in diameter. This is connected to the old stations of the several companies that have been bought up by the Chartered Company, which latter now supplies over one-fourth part of the total gas consumed in the metropolis.

Vast as are their resources they are equalled in extent of supply by the Imperial Gas Company, by whom also building operations of great magnitude are at this moment being carried on.

Without particularizing the operations of the gas companies in detail, I will give you the total result of the past year's working of all those which are included in the Metropolis Gas Act of 1860.

Total capital, including borrowed moneys upon which interest and dividends are paid, £8,272,816.

The total gas receipts from meter rental and public lamps consumption were as follows:

Common coal gas.....	£1,598,563
Cannel coal gas.....	220,069
Public lamps, including lighting same	226,580

Thus showing total receipts for gas to be £2,045,313. In addition to these sums the meter rental received amounted to $31,558, and the residual products, £124,952.

The total quantity of gas manufactured was 11,890 million cubic feet, and the quantity of coal used to produce this was 1,225,815 tons. The gross profit made amounted to the sum of £732,829.

From the above figures, applying as they do to the metropolis only, some idea may be formed of the importance of this branch of engineering and manufacture in the United Kingdom generally. Yet, large as is the consumption of gas, the elasticity of increasing demands is scarcely less surprising, and we may take it that on an average with the whole of the gas companies throughout the kingdom the annual increase in manufacture is from 7 to 10 per cent.

From the importance of gas lighting, the subject ever affords large scope for improvements both in its manufacture and distribution. In connection with gas lighting, two inventions have during the past year been introduced, which, according to the views of their respective promoters, are likely to bring about a radical change in the manufacture of gas. The first is a process by which Dr. Eveleigh, the inventor, proposes to greatly improve the illuminating power of gas without additional cost in its manufacture—a most desirable object, if it can be satisfactorily effected. A company has been formed for the purpose of ascertaining whether or not the process of manufacture, carried out on a large practical and commercial scale, will justify the anticipations founded upon the laboratory experiments. We hope soon to be made acquainted with the results of this method.

The second invention to which I refer is one that has lately been tested at the Crystal Palace, at Sydenham, and is known as the oxyhydric light. It was introduced at the Paris Exhibition, 1867, but was not tried in England before the occasion just mentioned. The method consists of introducing oxygen gas at the point of combustion with the ordinary coal gas. The principle has been well known for many years, but the cost of making oxygen has been hitherto so great as to exclude that gas from such applications, although it ensures perfect combustion, and hence a greatly improved light. The chief object of the present invention is to generate oxygen under a new process, by which its cost is materially reduced. No doubt it possesses great scientific merit; but whether its commercial value will be equally good remains to be determined.

It cannot fail to be noticed, as a tendency of the times, that local authorities are desirous of absorbing all gas and water companies' interests. It is also evident that the Legislature is favoring such a policy, and judging from the transfers now taking place, it may be fairly anticipated in a few years, all these undertakings will be purchased and worked by the municipal or other existing local authorities.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

[In the absence of the Editor, the following voluminous communication was put in type, without consultation with him, and he is not therefore responsible for its insertion.—Publisher.]

Giles's Patent Multifold Pressure Reliever.

Boston, Mass., August 10, 1872.

Mr. Editor: In my communication to your Journal, published August 2nd, I referred to various mechanical devices for dispensing with the dip-pipe seal in the manufacture of illuminating gas. Since then, a pamphlet entitled as above, giving a description of one of these contrivances, for which letters patent of the United States were granted to Alonzo M. Giles, of Boston, Mass. March 26, 1872, has been put in circulation, signed by J. Otis Wetherbee, Augustus Flagg, A. M. Giles, Trustees, and Malcolm S. Greenough, Treasurer.

As this pamphlet was evidently designed to meet the eye of gas engineers, and others having the charge of gas works throughout the United States, will you permit me, for the benefit of your readers, to make use of the columns of your Journal briefly to review it.

Mr. Giles's claim is as follows:

"1. A series of retorts, each provided with a dip-pipe and connected with a common pipe, communicating with the upper portion of the hydraulic main, or with a secondary main or receiver, in combination with a valve or cut-off, so arranged that when shut it will prevent the gas from passing from the retorts into the pipe, or from the pipe of one retort into that of another, and when open will allow the gas to flow freely, and without pressure, from the whole series of retorts to the desired point, substantially as described.

"2. I also claim, in combination with a gas apparatus constructed as above described, the valves or stop-cocks *c*, as and for the purpose set forth."

In the specification we read—"Each of the connecting pipes is provided with a valve or stop cock, *c*, so as to admit of any particular retort, or retorts, being shut off for repairs."

On the 27th of June, 1871, about ten months prior to the date of the Giles patent, letters patent were issued to Edward Jones, of Boston, Mass., for a similar, but much more simple device for accomplishing the same purpose. Mr. Jones's claim is as follows:

"The outlet pipe with its valve or cut-off, connected with the retort, so as to conduct the gas without pressure to the desired point, in combination with the outlet pipe, which is also connected with the retort, and extends down into the liquid contents of the hydraulic main, so as to form a "dip-seal."

On the 19th day of September, 1871, about six months prior to the date of the Giles patent, letters were issued to William Gibson, of Cambridge, Mass., for a still more simple device, having the same end in view. Mr. Gibson's claim in this patent is as follows:

"1. An automatic dip-pipe seal and valve combined in the same chest, the gate or plug of the valve being arranged so as to close the direct passage only, without at any time closing the dip-pipe, for the purpose as fully set forth and described.

"2. [The valve plug] as described, with the upper side curved sloping toward the dip-pipe, in manner and for the purpose set forth.

"3. The soft metal guides in combination with a sliding plug, for the purpose as herein fully set forth and described."

It will be seen that the latter patent interferes with the patent granted to Mr. Jones, inasmuch as there are two passages from each retort leading into the hydraulic main. It differs from it, however, as the two passages are embraced in a single shell or pipe, whereas, in the Jones invention, two pipes are required. In this respect the Giles patent is an infringement upon the Jones patent. It has but little claim to novelty, and it requires only a slight examination to perceive that it deserves no merit for simplicity. The following letter from Professer Hedrick, Chief Examiner at the Patent Office, shows the grounds upon which Mr. Giles's patent was granted:

Washington, D. C., April 10th, 1872.

"Dear Sir: I send you a copy of Giles's patent. You will see that it is not 'identical' with Jones's, but is on the same principle, and no doubt infringes the Jones patent. But Giles made a proper disclaimer of Jones and Gibson, as you will see by reading the specification. The object of Giles is to work *all* the retorts of a bench by *one* valve, whilst Jones and Gibson have a separate valve for each retort.

Yours truly,
B. S. Hedrick.

The Giles patent has not the merit of novelty, even in those respects in which the device that he claims differs from the two devices referred to, for, on the 17th of October, 1871, about five months prior to the date of Mr. Giles's claim, Letters Patent were issued to Charles Collier, of Selma, Alabama, for a plan by which the gas from the retorts is conveyed either through the dip-pipe within the hydraulic main, or, by opening a valve, through a separate pipe, to a dry main or receiver. Mr. Giles in his specification says: "the pipe m"—that is the main pipe—"instead of communicating with the hydraulic main, may be led into a secondary empty main." Mr. Collier's claim is as follows:

1st The dry main or receiver, and the arch-pipe in combination with the hydraulic main, substantially as herein shown and described.

2d. In combination with the above, the valve with its pipe connections, with the dip, bridge, and stand pipes, the rods, lever, and weights, or their equivalents, for operating the same in the manner as, and for the purposes, herein set forth.

Again in the specification forming part of the patent granted to Mr. Jones, June 27, 1871, we read: "Any suitable valve or cut-off may be applied to the pipe, D," (that is the branch-pipe, which is independent of the dip-pipe) "and instead of leading the pipe, D, into the hydraulic main, it may be led directly to the point to which it is desired to conduct the gas, without departing from the spirit of my invention, the principle of which consists in providing a means of conducting the gas from the retort to the desired point, whether the valve is open or closed."

Moreover I have in my possession a drawing of a plan, made by Mr. Jones more than a year ago, which was at that time exhibited to me and to many others, which is in all respects identical with the one for which Mr. Giles patent was obtained. An exact copy of this drawing appears in the pamphlet.

But, as I stated in my last communication, neither of these devices can be used without infringement of the patent granted to William Gibson, on the 5th day of October, 1869, except it be with the consent of the company owning said patent.

In the pamphlet under consideration it is stated in reference to patents which "have been granted for coal-gas apparatus, in which valves or cut-offs between the retorts and the hydraulic main," that in all of them "a separate valve is required for each retort, which renders the apparatus complicated, and greatly increases its cost," and the advantages which it is claimed that the Giles' apparatus possesses over them are set forth as follows:

First. "Cheapness and simplicity of construction, one valve being sufficient for a series of any number of retorts, whereas a valve has heretofore been required for each retort.

Second. "Economy, there being a great saving of

time and labor, as but one valve requires to be operated, instead of a large number of valves as heretofore, while the labor and care heretofore necessary to clear these valves of tar, is also avoided. * * * *

Third. "Freedom from leakage, the single valve being out of the way, and not liable to be accidentally injured."

But on the same page of the pamphlet we read that, "each of the connecting pipes is provided with a valve or stop-cock, so as to admit of any particular retort, or retorts, being shut off; or, if it should not be desired to work the whole series of retorts connected with the pipe, D, at the same time." It is not easy to reconcile the claim for "*cheapness and simplicity of construction*" with this description of the Giles contrivance, which not only requires the same number of valves, as is now used, but one additional valve, and a series of additional pipes for each bench of retorts. These additional pipes, in a bench of six retorts, are a main vertical pipe, and four horizontal pipes, made up of four straight pipes and eight bent pipes, so that we have to provide no less than thirteen pieces for each bench of six retorts, over and above the six pieces required by the plan made use of by Mr. Gibson, or, in other words, nineteen parts in place of six in a bench of six retorts.

And as regards the "*great saving of time and labor*," by only closing and opening one valve instead of three, five, or six, at the time of changing the retorts, it is sufficient to say that practice has shown this "*time and labor*" to be altogether altogether too insignificant to deserve notice, as one or two seconds only are required to open or close a retort valve, and the labor is less then is required to merely slacken a retort-lid.

It is true that during the process of drawing and charging a bench of retorts arranged on the plan described by Mr. Giles, only one valve has to be closed, but this advantage claimed for the plan is not commensurate with the benefit of the assurance that all the valves connected with the bench, are in constant working order derived from their being in daily use.

On page 6 we find this remarkable passage: "Much time, care, and intelligence are required in operating these valves, and keeping them free from the tar with which they become obstructed; furthermore, the handles of these valves, which project down to near the mouths of the retorts, are frequently in the way, and are liable to be accidentally struck, which often deranges the valves and causes them to leak."

The foregoing passage is intended to apply to all retort valves, excepting only, of course, the retort valves of Mr. Giles.

Now the works of the Cambridge Gas-Light Company, those of the Charlestown Gas-Light Company, and of the South Boston Gas-Light Company, (all of which are provided with the Gibson improvement) are near to those which are in Mr. Giles's charge, and at all times accessible to him. The former have been in operation, in connection with retort valves, for more than three years, and the testimony of the engineers and employees at all of these works, shows that neither "*much time, care, or intelligence*" is required in operating the valves, or in keeping them free from tar, or that the handles are "*in the way*," or are "*liable to be accidentally struck*," deranging the valves and causing them "*to leak*."

On the contrary it has been shown, and of this Mr. Giles must have been well aware, that these retort valves do not leak, or become obstructed with tar, or other substance, one of them having been taken down for examination, after it had been in constant use for nearly two years, subjected to the careful scrutiny of experts, in Philadelphia, New York, Boston, and elsewhere, and found to be as free from obstruction, and as perfect as when first put in use. [See supplement to Gibson's Improvement in the Manufacture of Coal Gas, p. 6; 1871.] And furthermore, it was known to Mr. Giles that neither at the works in Charlestown or in South Boston, are there any *handles to the valves*, such as are alluded to in the pamphlet, they being provided with sockets, a single wooden handspike serving to open and close all of the retort valves in each of these works.

For the edification of the examiners at the United States Patent Office, in Washington, we make one more extract from the pamphlet under consideration, trusting that we shall not be charged with any doubt as to the author's modesty, whatever may be our opinion as to his knowledge of the subject upon which he so freely comments.

"On the 5th day of October, 1869, a United States patent was granted to William Gibson, for an invention similar to those above described in the aforesaid English patents.* Had the United States examiner, however, been aware of the grant of these patents, the patents to Gibson would not have been allowed; but notwithstanding such patent was granted, it is well known that it would not for a moment be sustained by the courts, as no United States patent is valid, if it can be proved that the invention covered thereby has been previously patented or described by other parties in any foreign country; and consequently, the right to place a valve or cut off at any point between the retort and the hydraulic main of a gas apparatus is public property in the United States, and a valve so placed can be freely used, without fear of infringement."

We hope no gas-light company will be led into error by this statement. The rights of a patentee, or the assignee of a patent like the one granted to Mr. Gibson in 1869, is no longer a mooted question. According to the English General Law relating to patents, "That for which a patent is solicited must be *new to public use*." "A patent may be obtained for England, although the subject of it may have been publicly known in Ireland or Scotland, or both of these countries." "The phrase '*new manufacture*,' is construed to mean '*something useful to the public*.'

According to the United States Patent Law, "the *application* of a method for producing a new substance, or an old one in a new way, by new machinery, or new combinations by which a different result is obtained, or obtained in a cheaper or better manner, is an invention, and is patentable."

Priority of an invention not perfected or reduced to practice, does not make void the claim of an inventor who perfects his invention and reduces it to practice. This is what was done by Mr. Gibson, and the result he attained, to use the language of the Hon. Commissioner, quoted in my previous communication, is the test of his invention. He found out that a particular method of making illuminating gas would increase the product, and improve the quality, and contrived a plan by which it could be carried into effect: this protects his patent not only in the particular contrivance used by him, but in the use of the method, whatever form of contrivance may be used to effect the object.

Yours respectfully,

J. H. Blake.

[Note by the Editor.—Returning, just as the forms are being made up for press, the Editor desires to say that he certainly thinks, in a matter which is of *direct* interest to only a section of the readers of the Journal, and which is in direct antagonism to a number of them, sufficient space has been given—almost wholly as yet *to one side* only of the question. What we should be glad to have (and we wish our readers to know that we have urged this repeatedly upon these gentlemen) is, further *figures* of actual results, obtained by experiment. These might lead to further discussion that would *profit all parties*.—Henry Wurtz.]

Chicago Hydrant Water.

H. A. Babcok, in a Chicago paper, says that in the Chicago water—pumped from Lake Michigan—are found, among living and dead vegetation always present, certain species of Algæ, particularly Diatomaceæ, which at one time are represented by a considerable number of individuals, are at another time found sparingly, or not at all, reappearing after a short time; and that a few species are almost always to be seen, while others appear very rarely.

During the warm weather of May and June, 1871, there was a marked and rapid increase in the amount of vegetation present in the water; and in the latter part of June and the first part of July, several animal forms, not previously observed, appeared, and in increasing numbers. At this time the water of Lake Michigan was nearly two feet higher than its usual level, and the pumps at Bridgeport, which before had thrown the foul water of the river into the canal, were not in operation. In consequence, the Chicago river, dammed, as it were, at both ends, became a stagnant pool, saturated with dead and decaying matter, and more than usually offensive. This condition of the river, and the gradual increase of living organisms in the hydrant water, continued up to the time that the course of the river was reversed by removing the locks in the canal. All who noticed the river at this time will recollect how soon its character was changed after the water of Lake Michigan was admitted.

My first examination of the hydrant water after this event revealed a similar and unexpected change in its character. Vegetable and animal forms had mostly disappeared. While a few days before, a sufficient number of diatoms for an evening's study could be obtained on a filter in a few minutes, now an hour would barely yield a like amount. Hesitating to base a conclusion upon a single observation, I communicated my impression to others interested in the same study, and their examinations, as well as my own, made subsequently, were sufficient to determine the fact that the reversal of the course of Chicago river, had decidedly increased the purity of the hydrant water, by removing a large part of the organisms it had previously contained. I have no doubt that the improvement in the sanitary condition of the city, so marked at the time, and attributed to the absence of the noxious effluvia of the river itself, was promoted by this change in the character of the hydrant water.

In seeking an explanation of this change, we should bear in mind that the shaft through which the water is admitted to the tunnel, is situated in the lake, about two miles from the shore, and a little to the northeast of the mouth of Chicago River; and that the bottom of the lake is very gradually depressed until, at the crib, the water is only forty feet.

The first explanation that occurred to me was, that the water of the river, of a greater specific gravity than that of the lake, was diffused over the bottom of the lake in a widening stream as a kind of under-current: that the organic matter with which it was charged, brought in contact in its slow progress eastward, with the pure water of the lake, became reorganized into living forms, some of which, borne as far as the crib, were returned to us through the hydrants; and the change in the course of the river deprived us of our diatoms, by diverting them into another channel.

Further consideration, however, convinced me that this theory, though perhaps partially correct, does not entirely account for the change.

Some species of diatoms, as Tabelleria fenestrata, and Fragilateria Crotonensis, produced in abundance all along the shore of the lake, are always to be found in the hydrant water. Surirella splendida, Cymatopleura solea, Stephanodiscus Niagaræ, Asterionella formosa, and a Cymbella, which one may sometimes observe in a shore gathering, are occasionally present. A Melosira, identical with that found in small streams flowing into the lake at Glencoe is often seen, Pleurosigma attenuatum more rarely: while Pleurosigma Spenceri, Amphiprora ornata, and a Rhizosolenia are the rarest species.

In a word we receive through the hydrants many of the free, unattached forms known to be produced along the lake shore and on streams entering the lake to the north of the city, as well as a few species whose origin has not been determined, while the stipitate or

[*For continuation see page* 64.]

* The patents referred to are those which were granted as follows: To Thomas Spinney, June 2, 1831; J. and T. Kirkman, July 22, 1852; A. A. Croll, July 7, 1853; W. C. Holmes, June 20, 1855. Neither of these inventions proved to be practicable, or were ever brought into use.

THE AMERICAN

GAS-LIGHT JOURNAL

AND

Chemical Repertory,

PUBLISHED ON THE 2D AND 16TH OF EACH MONTH,

At No. 42 Pine Street, New York.

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR---PROF. HENRY WURTZ.
Editor's Private Office, 26 Pine St., Room 36.

THIS IS A recognized official organ of—
LIGHT, HEAT, MINING INTERESTS, STEAM,
WATER-SUPPLY, PATENTED INVENTIONS,
VENTILATION, SANITARY IMPOVEMENT, AND
GENERAL CHEMICAL SCIENCE.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance.

AGENTS:

NEW YORK—AMERICAN NEWS COMPANY, 119 and 121 Nassau St
BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—COE, WETHERILL & Co., Ledger Buildings, Phila.
Germany—B. WESTERMANN & Co., of New York.
Great Britain—TRUBNER & Co., 60 Paternoster Row, London.
France—LE JOURNAL DE L'ECLAIRAGE AU GAZ, 25 Boulevard Poissonniere.
Brussels, Belgium—HENRI BERGE.

☞ All communications to be addressed to "THE EDITOR, No. 42 Pine Street, Room 18, New York.

FRIDAY, AUGUST 16, 1872.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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AMERICAN RESOURCES IN GAS AND FUEL.

There has been much, in recent British current literature, on the subject of their coal-supply. Mr. Church, in his Inaugural (see our last) gives the latest *resume* of the subject we have seen. It seems that all their coal above 4,000 feet in depth, cannot last them, on any reasonable calculation, more than three or four hundred years. When these figures were first arrived at, even those who believed them, thought there was no cause for alarm for some generations at least. "Where ignorance is bliss, 'tis folly to be wise." Was there ever such an illustration as this in all history of the old maxim? It was not perceived that values which are in reality fictitious, may long remain so through human ignorance and credulity, but when the basis of this belief is destroyed, the whole fabric falls. Why should not the same apply to countries as to individuals? If any man had a supposed *inexhaustible* mass of coal, and was hence in the habit of selling cheap to his neighbors, and suddenly found it quite exhaustible, would he any longer sell it cheap? Other considerations enter, vital to the future of England, nay, of the world, which we cannot touch.

It has occurred that it may be a matter of interest and curiosity, even if of no immediate value, to make some slight calculations as to the basis of future American prosperity.

A fair estimate of the area of coal lands in the United States and British Provinces is 150,000 square miles. This is independent of the incalculable amounts of lignite in the trans-Mississippi regions. On consultation with a geologist of much familiarity with the subject, we concluded that it would be preposterous to put the thickness of workable coal above 4,000 feet, over this area, at less than ten feet. This makes one million million tons of coal in all. Taking London as a criterion (where the relative consumption of coal for fuel and for gas is as 5 to 1) 100,000,000,000 tons of this are available for gas purposes, but if the consumption of gas for fuel doubles, it would double this. Now, if we were ever to have a population containing a hundred million gas consumers, and allow four feet per head per day, this would last such a population *one hundred and thirty seven centuries.*

FUTURE USE OF GAS IN AMERICA.

The Future of the Gas Manufacture in America is a subject that justifies, when all the elements that enter are duly considered and duly valued, anticipations of the most exalted kind.

The time is not far off when this continent will become the dwelling place of at least a moiety of civilized mankind, and the materials for making gas are doubtless a hundred fold more abundant, and more widely diffused than on any other continent. Already it is a well-recognized fact that the use of gas for lighting *private residences*, is far more general with us than with any other large population.

In almost every section of our country, a town or even a village no sooner reaches a sufficiency of population to keep a bench of retorts alive, than a gas works is one of the very first things projected and executed. So distinctly has this product already become a *necessary of life* to us all, that during an accidental cutting-off of the gas from a large district of New York, a few months since, the public prints headed their accounts "GAS FAMINE."

It has already been repeatedly claimed in these columns, and the claim is now again made, that within a few years, we trust very few, this state of things, even now of such pregnant augury to the American Fraternity, will be greatly and rapidly intensified, and even in an increasing ratio! This we mean, wholly independent of the natural increase of population, which is itself often in ratios similar to compound interest. What we mean, as many readers already divine, is the introduction to our populace of improved apparatus for utilizing gas as *fuel*. In many places in Great Britain, this process has been going on, and within a surprisingly short space of time has led to results almost revolutionary. Some weeks ago, in remarking on the Referees' Beckton Report, we quoted from the chief official of those works:

"The facts are astonishing; the people seem to take all we can give, and still ask for more gas." It has been found necessary at once to *double the capacity* of these huge works.

In the extract we give to-day from an address of Mr. Church last February, he also said:

"Large as is the consumption of gas, the elasticity of increasing demands is scarcely less surprising."

Shall we not initiate in our American cities, the movement now going on over the water. Nothing would more surely or more speedily inure to the *mutual* benefit of both consumer and producer, and tend to convince our people that the gas interest is not made up of mere selfish and grinding monopolies. By multiplying largely the consumption of gas, this would soon greatly benefit large classes, especially the poor, by enabling gas to be brought, in point of price, within the reach of all; thus enabling the convenience, comfort, cleanliness, compactness, and other eminent advantages of gas-cookery to be enjoyed by all. Inventors and manufacturers would be encouraged quickly to produce cheap, simple, economical, safe, odorless, and automatic gas stoves, which would be attainable readily by the same classes.

☞ The writer of this is on the point of proposing to Gas Companies to assist him in carrying out a plan which he has organized and perfected, for the attainment of all these blessings, besides others.

THE NEW GAS PROCESSES.

The Final Report on the new Elmer Process must still be deferred to the next issue, there being numerous details to fill up, which take much more time than was anticipated. The general results are similar to the one reported in the last issue, and some have been obtained still better.

In the mean time, our readers have, according to promise, Mr. Mellor's Report on the Eveleigh apparatus, in full, with a part of the discussion thereon, giving the whole story regarding this mode of working, which is founded on principles of operation, as we have before shown, bearing so close an analogy with those of Elmer. We should repeat, however, as we have before said, that the apparatus of these two inventors, as well as their *modus operandi*, diverge widely in many respects. Our exact meaning is (so that there may be no misunderstanding) that both modes of operation illustrate and demonstrate the same general scientific principle, that much less of the "volatile matter" of the coal is lost, in the form of condensed, intractable, carbonized, pitchy or tarry products, which, once formed, have never been found convertible again into gas of profitable value. The Elmer method,

however, goes at this much more simply and directly than the Eveleigh.

Mr. Mellor, like most other gas experts, holds to the idea that gas evolved in iron retorts at low temperatures, is likely to contain less sulphur in other forms than sulphuretted hydrogen, than when in clay retorts; an opinion which, as we have before shown, is not in accord with recent investigations of chemists. In the experiments now going on here, this point will receive such attention as is practicable.

Had we time, we should give some words, and sharp ones, to the remarks of Mr. Clift, in the discussion. We think, however, that his absurdities and unjust perversions, both of language and facts, will be manifest to all attentive readers.

In the London *Journal of Gas-Lighting* for July 16th appears, in Correspondence, the following:

"* * * * * we take Mr. Mellor's figures as given in his paper, we find that the whole of the second process (or the tar distilling) adds no light-giving substance to the gas obtained in the first instance. True the bulk is increased from 8,800 cubic feet to 11,000, but this 11,000 feet of 20-candle gas contains no more light than the 8,800 feet of 25-candle gas. Now, sir, this fact naturally suggests the question, is this 2,200 feet of non-light-giving substance worth the trouble and expense of the tar-distilling apparatus, together with, perhaps, a smart royalty?

"JOHN ROBINSON.

"Gas Works, Coleraine, July 10, 1872."

Here is another slur, displaying gross ignorance, or sophistry. We ask Mr. Robinson whether he puts the additional 2200 feet of gas on a par with air, nitrogen, or other valueless gas? The fact that it acts as a *diluent*, like marsh gas or hydrogen, proves that it is not valueless Air would *destroy*, in this proportion, almost all the candle power. Suppose Mr. Robinson had 8800 feet of 25 candle gas, would not both he and his consumers desire, and demand, that it be brought down to 20 candles, or even less?

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Under date of July 4th, we have the official announcement regarding the place of meeting of this body, at Dubuque, Iowa, August 21st. The place is too far off to admit of the presence of many eastern scientists. Are we ever to have one meeting of the Association in New York? The Metropolis has always been super-eminent among large cities for its total neglect, tantamount to contempt, for Science, and her votaries. This stigma is borne lightly, doubtless, by our famous merchants and financiers. Science is doubtless good for the world, upon the whole, and may even be "a good thing to have about the house" at least for the children (if they don't get too much of it); but as for spending our money on it, why what kind of an "investment" would *that* be?

DENNIS LONG'S PIPE FOUNDRY.—We take pleasure in informing our readers that the Union Foundry, which was destroyed by fire in January last, is again in operation. These works have been in the reconstruction, enlarged and much improved, giving a much greater capacity for the manufacture of pipe than before.

MARK LEVY,

Contractor and Builder of Gas Works,

OF THE LATEST IMPROVED PLANS,

No. 26 West 43rd Street, New York.

Patentee of a new process of manufacturing Gas from Wood, etc. 303-2t

WOOD GAS.

THE INVENTOR AND PATENTEE OF A NEW AND improved Retort for manufacturing Gas from Wood, Turf, etc., would call the attention of Gas Companies, and the public generally, to an invention which will be a great saving to the community, as they can thereby supply an exceedingly cheap, clear, and brilliant light, besides useful products in profusion.

Companies desiring to change from the Coal to the Wood process, or private individuals wishing to purchase rights for Hotels, Factories, Private Houses, Cities, Counties, or States, will be furnished with all necessary information, by addressing the Inventor,

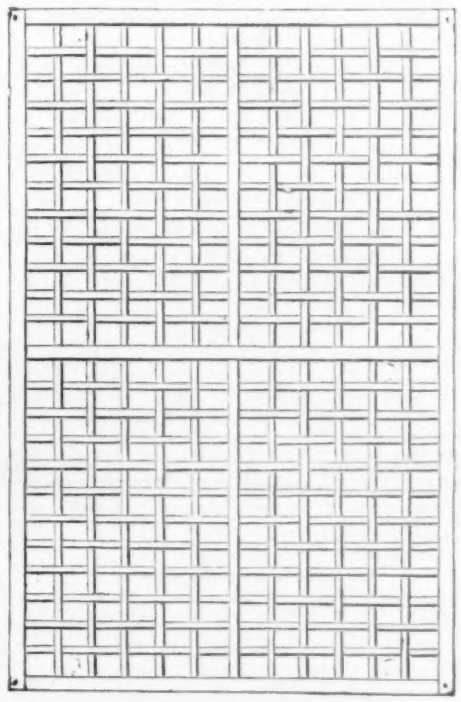
MARK LEVY,
303-2t No. 26 West 43rd Street, N. Y.

SPECIAL NOTICE.

PARTIES WRITING TO THE UNDERSIGNED ON GAS Matters, will please address J. B. CHICHESTER, Engineer, Bayonne and Greenville Gas-Light Co., 303-6m Bergen Point, N. J.

AMERICAN

GAS SCREEN MAN'F'G COMPANY.



TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the Screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4te. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

LUTHER DAY, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why they will not last for a long time. The *very large amount of open space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this fact of having *open Trays* would become more apparent to managers of gas works. The difference in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respectfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years' trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3, 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, Esq.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.,
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them, being able to purify over fifty pet cent. more gas with them, than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU.

CHARLES HUBBARD, JR.,

Consulting Engineer.

Steel and Iron Forgings, Light and Heavy Steel Castings to any pattern. Would call attention to his new article for Blacksmith's Forges, Jones's Patent Tuyere Iron, which is in successful operation in the leading establishments; can be used in any Forge now at work, or in combination with Jones's Improved Cast Iron Forge, plain or galvanized. Is prepared to furnish estimates of all kinds of Iron work used in the construction and carrying on of Gas Works, including supplies. Sole agents for A. L. Havens's Adjustable Automatic Dip Seal and Improved Retort Lids. Will give personal attention to the prompt execution of all orders. Address 60 Vesey Street, New York. 301

JAMES A. WHITNEY, late Editor of the *American Artisan*, and for four years past President of the New York Society of Practical Engineering, has opened an office as

Patent Agent, Expert in Patent Cases, and Mechanical Engineer,

AT NO. 128 BROADWAY, ROOM 11, NEW YORK CITY,

Mr. Whitney has had a practical experience of more than twelve years spent in pursuits directly connected with industrial operations and Patent Agency business, which will enable him to care for the interests of his patrons in the most satisfactory manner. 298

[*Continued from page* 61.]

otherwise attached forms, as Gomphonema and Sinedra, though growing in abundance in this vicinity, are seldom represented.

There is in Lake Michigan a current that may be called constant, starting near the northern extremity of the lake, moving southward along the western shore, gradually wearing away the bluffs to the north of Chicago, receiving the contents of the numerous streams to the north, sweeping by the city and disposing its accumulated contents near the head of the lake and along the eastern shore. The interior of the lake, slightly, if at all, disturbed by this current, is comparatively still, and consequently clear and pure.

I am led to believe that the streams of Northern Illinois, Wisconsin, and even Northern Michigan are the sources whence we obtain some of the diatoms most rarely observed in the hydrant water; and that these forms coming with the influence of the southerly current of the lake are brought as far as the crib, which stands within the current, but near its easterly edge. In a gathering made at the mouth of Carp River, a stream of Northern Michigan, nearly opposite the Island of Mackinac, I have found an abundance of Pleurosigma attenuatum, Spencerii, Surirella splendida and Amphiprora ornata. It is probable that other streams in the vicinity, and to the southward of that named, produce the same species, which, specifically light, are borne by the current as far as Chicago, and that the reversal of the course of Chicago river has caused the lake current opposite the city to swerve slightly towards the west and admitted to the crib the pure water, from the deeper, undi turbed part of the lake.

Whether the river or the lake current, or, as I am inclined to believe, both combined, are the source of these organisms, there seems to be no doubt that, as long as there is kept up in the river a moderately rapid current from the lake, the city will be provided with water more nearly approaching in purity that at Mackinac and in Lake Superior, which are remarkable for their transparency.

At the present time there is but a slight current perceptible in the river, and we obtain through the hydrant many of the forms that were so abundant during the summer. In fact the water is quite impure, containing, in addition to the organic matter, much fine sand, dust, and other inorganic material. This fact seems to bear testimony in favor of my theory in regard to the action of the lake current; for the southwesterly winds that have blown so long over a region parched by an unprecedented drought, must have borne clouds of dust into the lake, and the northern bluffs, subjected to the same drought, must have yielded more readily than usual to the abrading action of the current which brings the accumulated gatherings past our city and into our dwellings.

The Union Gas-Light Company of East New York.

EAST NEW YORK SUPPLYING GAS TO WOODHAVEN AND CYPRESS HILLS—BROOKLYN CAPITAL.

This company has just concluded the purchase of Mr. Horace A. Miller of eight lots of land on Atlantic Avenue and Jefferson street. The company has made this New Lotts addition to its real estate for the purpose of erecting additional buildings, which are to go up immediately. Some time ago our readers were informed that most of its stock changed hands, certain Brooklyn capitalists being the purchasers. Since the change, miles of new pipes have been laid, and the company's business greatly extended. The gas pipes have been laid through the whole length of Atlantic avenue to Woodhaven. Also through Cypress avenue to Plank Road, and through the Plank Road eastwardly to the new Truant Home (formerly Snedeker's Hotel).

Some idea of the rapid increase of the company's business may be obtained, when we state that a new gasometer of four times the capacity of the present one is to be built, and, in other respects buildings of double the capacity of the present ones to be immediately erected.

We understand that the stock of the Union Gas-light Company is now considerably above par, and we refer to this matter for the purpose of congratulating the enterprising Brooklyn capitalists on the success of their undertaking.

We understand that Mr. Harry Smith has received the contract for the erection of the new buildings, and it is his intention to commence operations immediately.—*Brooklyn Times.*

CALIFORNIA PAPERS announce the discovery of a body of coal near Santa Rosa, in Sonoma county, which is said to possess the qualities of the best bituminous coals of England—although this statement must be received with some grains of allowance until more extended tests of its properties can be made. It is said to coke well, and to produce an intense heat when burned. As no very extended geological examination of the locality has been made, it is, of course, impossible to form an opinion of the extent of the bed or its economical relations. The ordinary lignite of California occurs within a short distance of this reported coal vein. If the reports of its occurrence should be verified, it will be no less interesting than important to the people of that State.—*Am. Exch. and Review.*

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

AUGUST 16, 1872

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English Cannel.			
Ince Hall	$13 50	@	14 00
Kirkless Hall	13 00	@	13 50
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Newcastle Gas	$7 50	@	8 00
Liverpool caking	7 25	@	7 50
British Province Coals.			
International—At Mines, $2 00 in currency	—		—
Block House—At Mines, $1 50, Gold	6		25
Little Glace Bay—At Mines, 1 60 Gold	—		—
Pennsylvania Coals.			
Penn Gas Coal—At Amboy	$6 75	@	0 00
Westmoreland	6 75	@	0 10
Shafton	6 00	@	0 00
Youghiogeny—At Baltimore	5 50	@	0 00
West Virginia Coals.			
Murphy Run	$6 75	@	0 00
Despard	6 75	@	0 00
West Fairmont	6 87½	@	7 00
American Gas Coal	6 62½	@	6 75
Fairmont	6 75	@	0 00
Newburgh Orrel	6 75	@	0 00
Pinnickinick	6 75	@	0 00
Cloverhill of Virginia	5 25	@	5 50
McKenzie Compound Mixture			8 00
American Cannel Coals.			
Peytona of West Virginia	$14 00	@	14 50
Darlington of Pennsylvania			— —
American Cannel	$10 00	@	10 00
Asphalts.			
Albertite of New Brunswick	$18 00	@	18 00
Ritchie Mineral of West Virginia	17 10	@	00 00
Trinidad Bitumen	— —	@	14 05

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Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Philadelphia ... 4
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School of Mines, Columbia College, East 49th st ... 5
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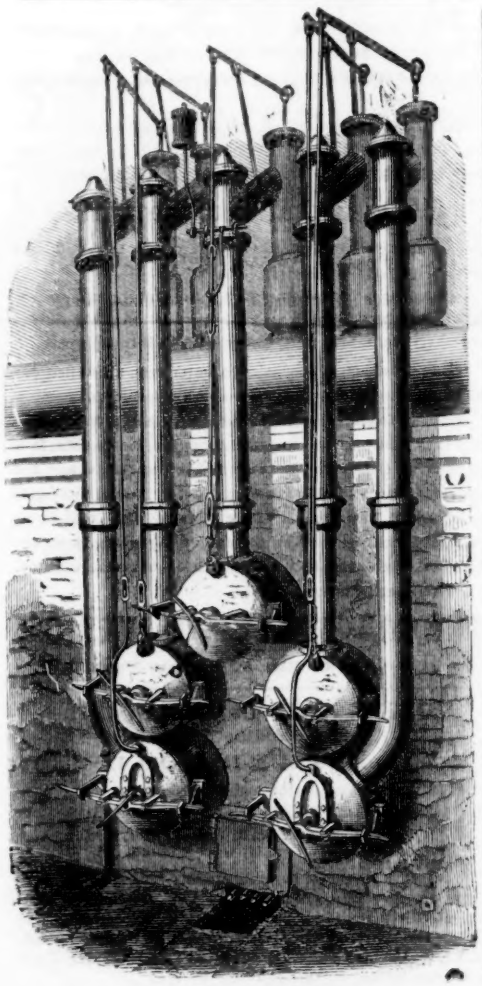

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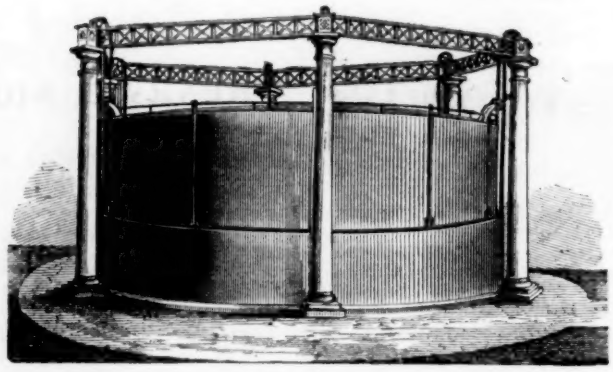

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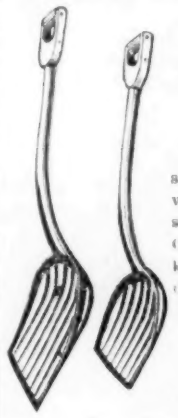

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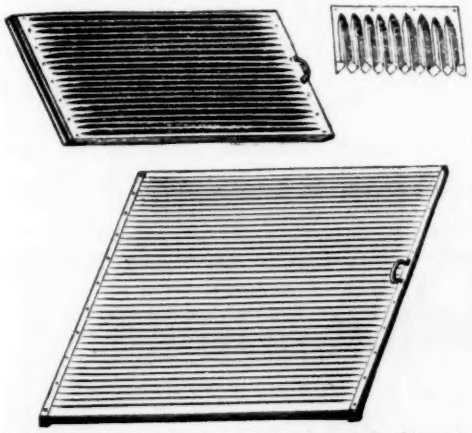

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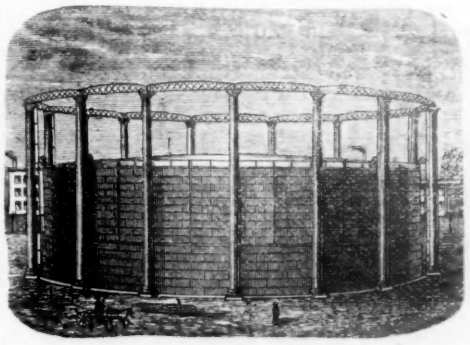

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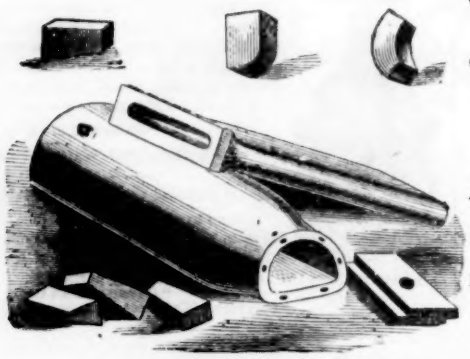

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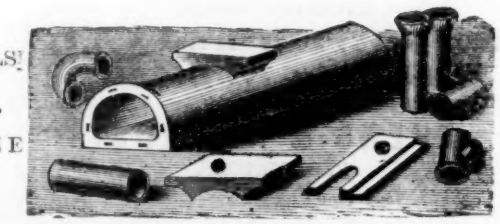

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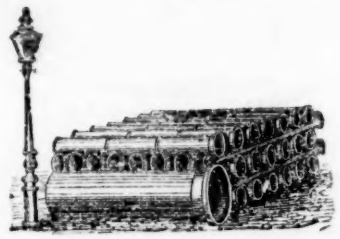

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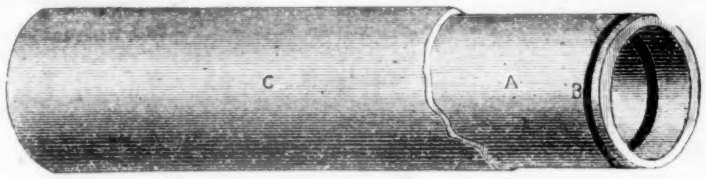

FIG. 2.

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3—Horizontal Section and Connection.

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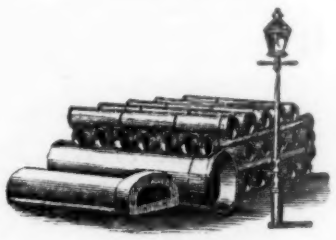

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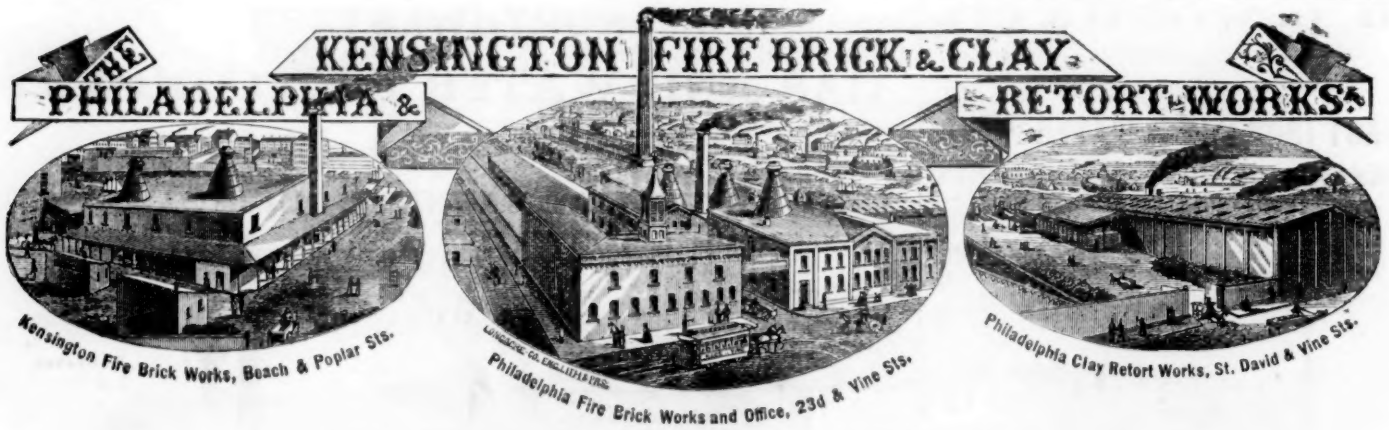
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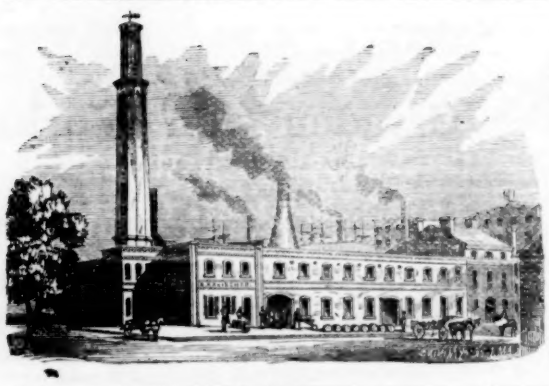

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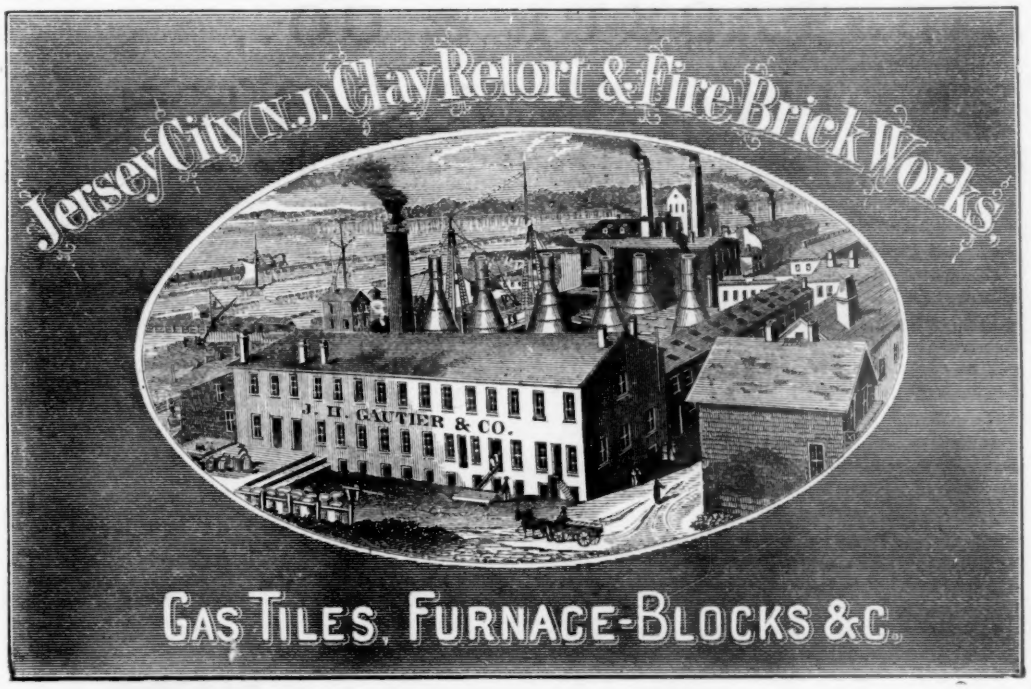

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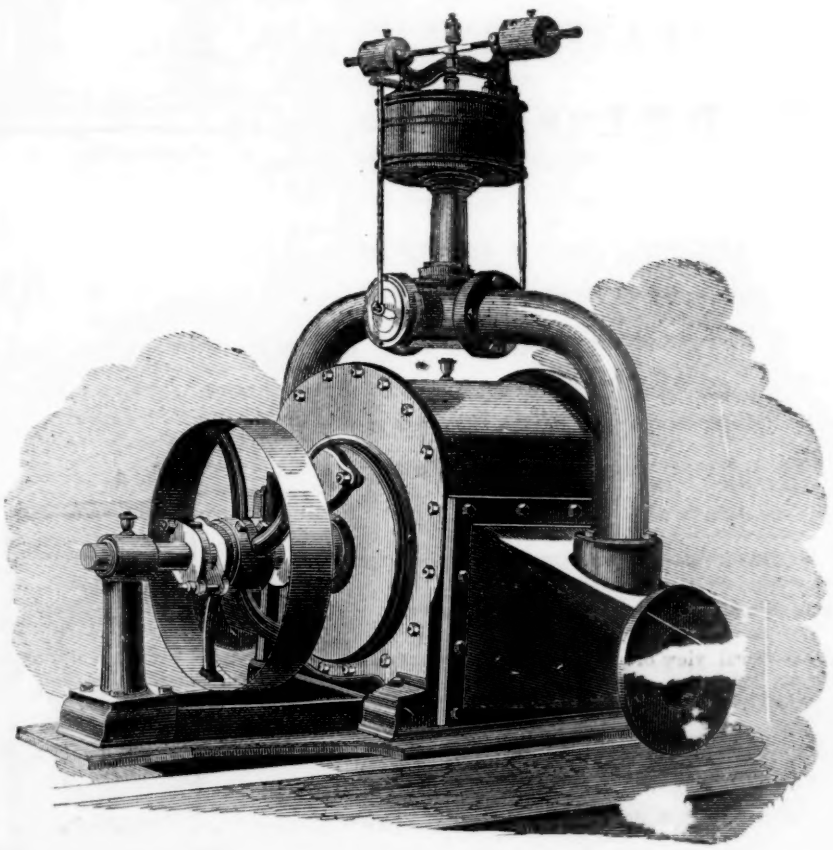

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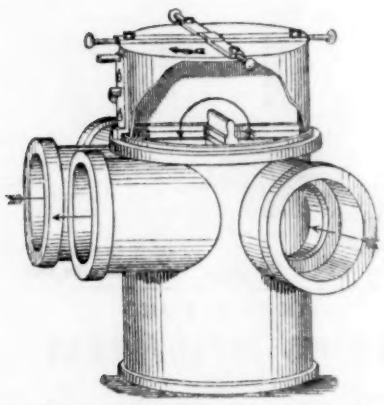
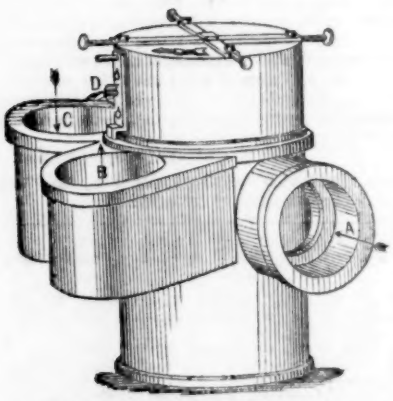


By Pass with Drip for Single Apparatus.

No. 3.



Meter By Pass with Drip.

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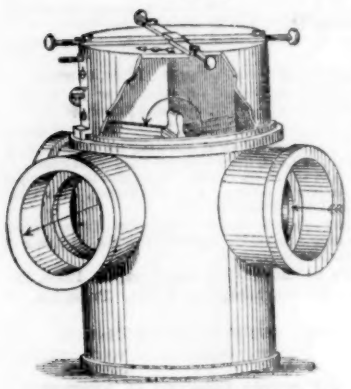

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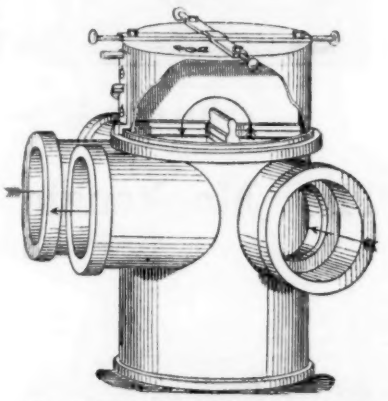
No. 2 is a By-Pass for using two apparatus, the gas is entered and the direction of its current is controlled similarly to that of No. 1, just described.

No. 3 is a By-Pass for passing the gas around the meter or not, according to the set of the loose or circular valve.

No. 4 is a sectional view of No. 3, and fully illustrates the construction and arrangement of the various By-Passes; the vertical partitions P are placed at right angles and divide the By-Pass into four drip chambers, they extend to within a short distance of the bottom to allow the water W, which forms the water seal, to circulate freely; the valve V is constructed with a diaphragm which divides it diametrically, the edges from ground joints with the upper edges of the partitions P, to prevent the gas from leaking from one chamber to another, and also to protect the ground surfaces from the corrosive action of the gas.

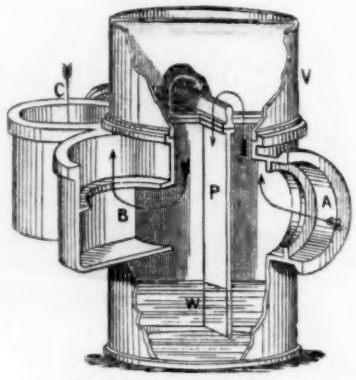
No. 5 is a single By-Pass with Drip Chambers.

No. 2.



By Pass with Drips for two Apparatus.

No. 4.



Section of No. 3.